

duced with this paper (fig. 1). This diagram shows graphically the relationship that exists between the late afternoon and evening temperature and the number of codling moth eggs laid daily. The average daily temperature for the 6-hour period, 3 p. m. to 9 p. m., is

Newcomer, a temperature of 60° or higher at 8 p. m. for two or three nights in succession will produce enough eggs to make a spray necessary, and that as these eggs will hatch in from one to three weeks, depending on the temperature, the spray must be applied accordingly. He further states that if the weather turns cold, that is, with maximum temperatures of 70° or lower, after these eggs are laid, the spray would not have to be on the trees for ten days or two weeks, while if it remains warm (maximum 75° or higher) the spray should be on in a week.

With the desire of cooperating as fully as practicable with the office of the district horticulturist in the work of determining the proper spraying dates for codling moth, the Walla Walla station of the Weather Bureau has installed thermometer shelters in three different parts of the Walla Walla fruit district. Each shelter is equipped with maximum and minimum thermometers and a short-range thermograph. As the temperature varies considerably in different parts of the district owing to differences in topography, more than one station is needed for best results. Two of the shelters are located in commercial apple orchards, and one in the yard of the writer's home in the city of Walla Walla. These special stations have been in operation for the last five seasons, and the records, in the words of one of the horticulturists, "have played a large part in codling-moth control in this district." Those that are located in the orchards are in close proximity to the codling-moth cages, and the records are kept by the orchardists who also keep the records of moth emergence. A view of one of the moth cages is shown in Figure 2. These are located in the Pomona orchard, northeast of Walla Walla.

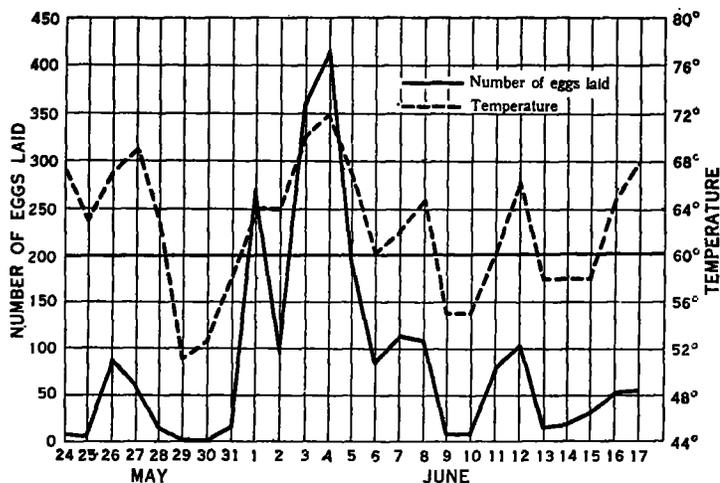


FIG. 1.—Relationship between late afternoon and evening temperature and the number of eggs laid daily by the codling moth.

shown on the chart by the broken line. The number of eggs laid is indicated by the solid line. Mr. Newcomer states that this is merely a sample taken from their records for four years. It will be seen that when the temperature drops below the 60° line, the number of eggs laid drops to zero or nearly to zero. According to Mr.

THREE WISCONSIN SNOWSTORMS.

By W. P. STEWART, Meteorologist.

[Weather Bureau, Milwaukee, Wis., April 21, 1923.]

The average snowfall in Wisconsin during March, 1923, was 19.8 inches. This is the greatest of record and is more than double the usual March snowfall. The greatest previous average for the State was 18.3 inches in 1891, and the least, 0.8 inch in 1910. Because of snowdrifts, highways throughout Wisconsin were impassable except for horse-drawn vehicles during the greater part of the month.

In most sections it was a month of frequent and heavy snows. Snow fell in some part of the State every day in the month but one. The first general and considerable snowfall occurred on March 4. This was heaviest in the vicinity of La Crosse where much damage was done to trees and overhead-wire systems. This was followed by intermittent snows from the 6th to the 9th. Then followed a series of 3 storms during which most of the month's snowfall occurred; crossing the State in rapid succession they made almost one continuous snowstorm throughout the second decade. These storms delayed rail traffic, damaged overhead-wire systems, blocked highways, and caused an economic and property loss in Wisconsin estimated at over \$1,000,000.

The first of these three storms occurred on March 11, 12, and 13, in connection with the movement eastward across the State of a barometric depression of unusual intensity. During its passage the barometer at Milwaukee fell to 28.82 inches, sea-level reading. This is the lowest of record with one exception. The snow from this storm was unusually moist, so there was little drifting, notwithstanding a gale of 30 to 60 miles. The snowfall in southern and eastern Wisconsin ranged from 6 to 20 inches, the heaviest being in southern counties near Lake Michigan. The moist snow, at first mixed with some rain and sleet, stuck to wires, poles, and trees, and froze there. This made a coating of porous ice, or mixed ice and snow, which on wires and the small branches of trees and shrubbery was about 1½ inches in diameter. Over a wide area in southern and southeastern Wisconsin branches of trees, and in many cases whole trees, broke down. These in turn, aided by the gale, bore down thousands of telegraph and telephone poles and many miles of wire. One company alone estimated its loss from this cause at \$250,000. Telegraph and telephone services were more or less seriously delayed for approximately 5 days.

The second of these snowstorms began during the night of March 14 in connection with another energetic disturbance which crossed the State from southwest to northeast on the 15th. This caused a snowfall which in central, eastern and southern counties averaged from 3 to 12 inches. In this storm the wind was not so high, but the snow was comparatively dry and drifted badly.

The third storm crossed Wisconsin on the 17-18th, causing snow which, in southern and eastern counties, ranged from 3 to 11 inches. In many localities this storm was described as the worst of the three. There was a fine, sleet-like snow, driven by a high wind, and accompanied by a rapid fall in temperature. At Milwaukee the temperature fell from 38° at 1 a. m. the 18th, to -3° at 6 a. m. the 19th. In this cold wave the temperature fell to -10° along the middle Illinois border, and to -20° to -30° or lower in the northern part of the State. At the end of this storm there were many snowdrifts in southeastern Wisconsin from 8 to 10 feet deep.

Prior to the second of these storms the snow had melted slightly and there was considerable soft snow, and in many places slush and water, on streets and highways and in railway cuts. On highways this had been cut

into deep ruts wherever the roads were passable. With the advent of severe cold this mass was frozen into solid ice, much of which remained on the highways until the middle of the first decade in April.

On railway and interurban lines the combined effect of the three snowstorms and the cold wave was to tie up traffic for a period ranging in different localities from one to eight days, the longer periods being on branch lines. Much of the delay was caused by the interrupted telegraph and telephone services, but many trains were stalled in snowdrifts and many cuts had to be shoveled out by hand, and some places had to be chopped out with axes or picks. The most serious delay in the movement of freight was caused by the blocking of the railway yards by snow and the freezing of the car wheels to the tracks.

After these storms there was again intermittent snowfall to the end of the month, but in southern counties the snow melted rapidly and on April 1 fields were bare over a wide area. However, there were still many drifts in southern localities 3 to 6 feet deep, while in northern counties the average depth in many places was 20 to 30 inches.

SNOWSTORMS OF MARCH 11-18, 1923, AT DUBUQUE, IOWA, AND VICINITY.

By H. MERRILL WILLS, Meteorologist.

[Weather Bureau, Dubuque, Iowa, March 26, 1923.]

Three rather remarkable snowstorms occurred in Dubuque and vicinity on March 11-12, 14-15, and 18.

First storm.—The snowstorm of the 11th-12th, in which 6 inches of snow fell within 24 hours, with 0.2 inch more added on the following night, was unusually heavy for the season and more than twice the greatest 24-hour fall of the present winter; but the outstanding feature of the storm was its peculiarly damaging effects. The storm attended the passage eastward near Dubuque of an area of unusually low barometric pressure, the lowest sea-level reading at Dubuque being 29.12 inches at 1:30 a. m. of the 12th. The storm began as rain on the evening of the 11th, gradually turning to wet snow. The temperature did not vary more than one or two degrees from freezing during the whole period of fall (8 p. m. of the 11th to 7 p. m. of the 12th), and the wet snow stuck to the trees, wires, poles, roofs, etc. The wind was only moderate, the maximum velocity being 23 miles from the north at 4:12 a. m., but the extreme weight of the clinging snow was sufficient to break down large branches of trees,—in some cases whole trees,—and telegraph and telephone wires and poles in all parts of Dubuque and vicinity; in many instances additional wires were broken down by the falling trees and branches. Practically every street was blocked in places by the debris. In some sections scores of broken branches could be seen from a given point and the appearance was such as to give the effect of a destructive windstorm.

Snowplows were used on the street railway lines all Sunday night, but the wet snow was difficult to remove, and all cars were off schedule Monday morning, some lines being blocked by snow and large branches or whole trees until about 9 a. m.

Electric light and power connections were destroyed in numerous sections of the city. Parts of the city were without electricity for hours. Telephone connection with the outside on Monday was entirely severed except for one toll line to McGregor. There were 43 poles down and 500 'phones out of commission in Dubuque County. All telegraph connection with the outside was cut off from 8 p. m. Sunday until 4:25 p. m. Monday when one

wire to Minneapolis began to function. No weather reports were received by wire and consequently no map was published, but State forecasts were received by radiophone and published on cards. The damage to telephone and telegraph lines was apparently greatest in Dubuque County and those adjoining and thence eastward through Jo Daviess, Stephenson, and Winnebago Counties in Illinois. Doubtless the greatest havoc in any one county was in Jo Daviess County, Illinois. One telegraph company reported a loss of 600 poles between Dubuque and Chicago, and it is not known how many the other company lost.

Trains on all roads were greatly delayed, partially by the snow on tracks, but mainly on account of the demoralized wire service and consequent lack of dispatching facilities. Tracks were practically all cleared of snow by Monday night, but it required several days to restore dispatching services, and trains were generally off schedule during this period. The Chicago, Milwaukee and St. Paul reported all trains off schedule for two or three days, and that their wires were broken down almost entirely by falling trees and branches. The Illinois Central reported trains delayed for a like period, and that their worst trouble was east of Dubuque, where 210 poles went down within the first ten miles. The Chicago Great Western suffered to about the same extent in delay to trains, and reported a loss of 150 poles. The Chicago, Burlington and Quincy being double-tracked, was not so hampered by the lack of dispatching service, but lost 200 poles between Dubuque and Savanna, Illinois.

Summarizing the effects of the storm in Jo Daviess and Dubuque Counties and adjoining territory, the monetary losses in such properties as steam and electric railways, electric light and power lines, and telegraph and telephone lines, alone, aside from the inconvenience and innumerable losses to the public through delayed shipments, delayed passenger trains, inability to communicate with the outside, etc., are conservatively estimated at \$120,000. Much of the repair work has been only temporary and it will be weeks before the work is completed. Not all estimates are yet available, and if the